



Some Insect Updates

Whitney Cranshaw

A Quick Review of Some 2019 Activities

- Update on **Biological Control of Japanese Beetle** project
- A trial to control **Rose Midge**
- An interesting new disease of hemp,
Beet Curly Top

Japanese Beetle Biological Control Program



Natural Enemies of Japanese Beetle Exist Elsewhere in the US

- ***Paenibacillus popilliae*** (Milky spore)
 - Bacterium
- ***Istocheta aldrichi****
 - Tachinid fly
- ***Tiphia* species***
 - Parasitic wasps
- ***Ovavesicula popilliae****
 - Microsporidium (fungus)

* Species involved in Colorado Japanese Beetle Biological Control Program

Natural Enemies of Japanese Beetle for Potential Introduction into Colorado?

Tiphia vernalis (Spring Tiphia) – parasitoid was of late stage Japanese beetle grubs



Photograph by David Shetlar, The Ohio State University

David Shetlar photo



Adults of the Spring Tiphia emerge in May. The adults feed on nectar and honeydew.



The availability of nearby sources of nectar and honeydew is important in the success of this insect as a biological control of Japanese beetle



Dan Potter, University of Kentucky, spraying sugar water on foliage to attract spring tiphia for collection.

A source of spring tiphia was developed in 2019, near Lexington, Kentucky





The 2019 wasps were released at a golf course site in Boulder

This site was chosen since it had **high numbers of grubs** *and nearby sources of nectar and honeydew*





Female wasps dig into the soil to locate Japanese beetle grubs that are nearly full-grown.

They then lay an egg on the grub.

The developing larva of the wasp feeds on and kills the grub.

It then pupates. The adult emerges next spring.

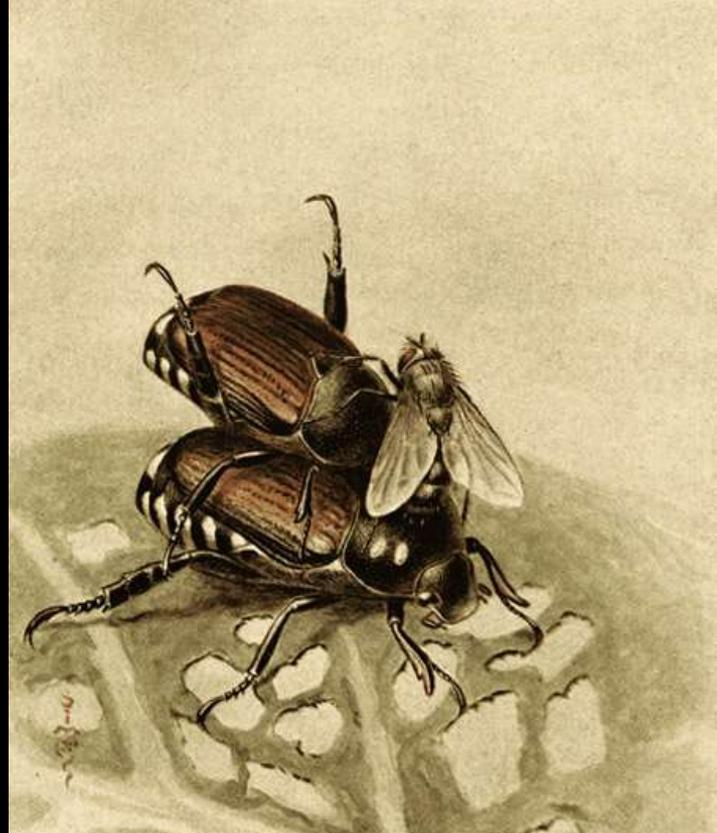


Status of *Tiphia vernalis* Releases

- **Boulder**
 - 1 Release Site (2019)
- **Littleton (CDA)**
 - 1 Release Site (2018, 2019)

Natural Enemies of Japanese Beetle for Potential Introduction into Colorado?

Istocheta aldrichi – tachinid fly parasitoid of Japanese beetle adults



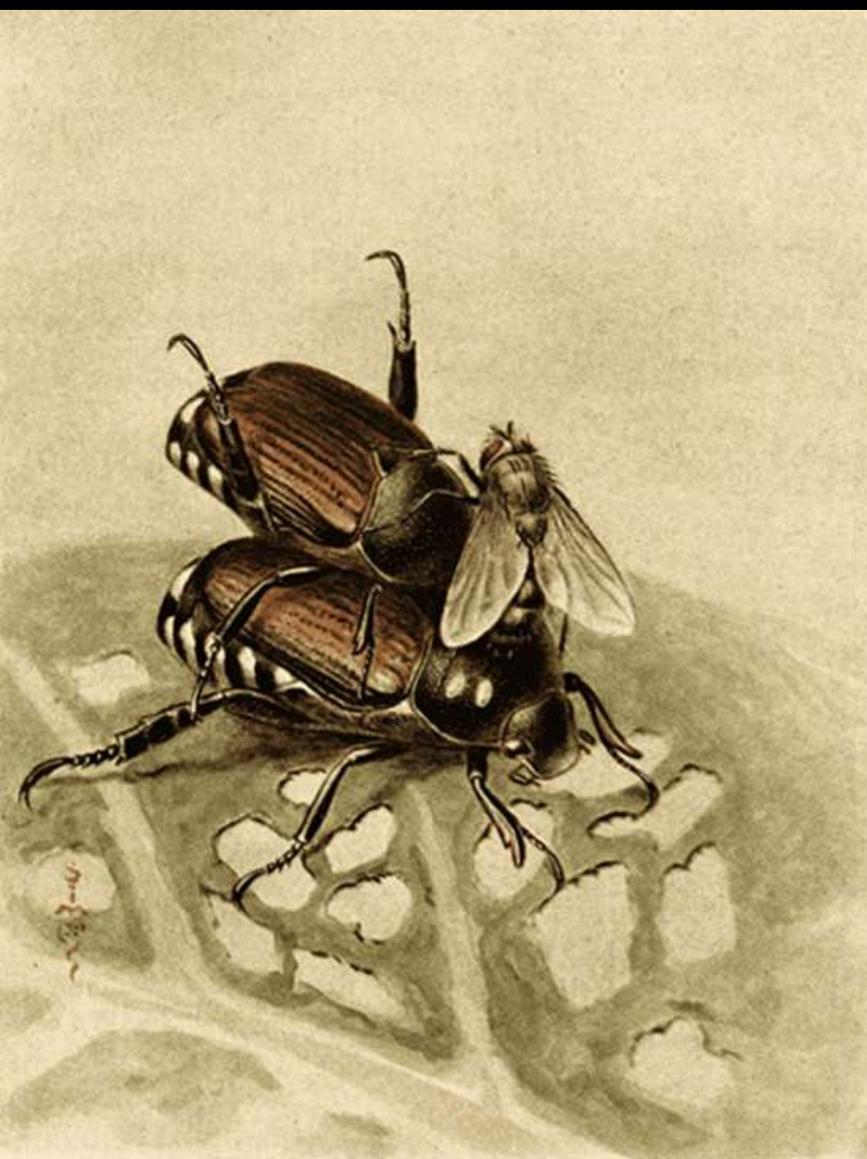
Istocheta aldrichii
requires accessible
nectar/pollen
resources when the
adults are active
– late June-July



A female *Centeter cinerea* in the act of ovipositing upon *Popillia japonica* female



5474271



A female *Centeter cinerea* in the act of ovipositing upon *Popillia japonica* female



Istocheta aldrichii
("winsome fly") lays
eggs on adult Japanese
beetles in July

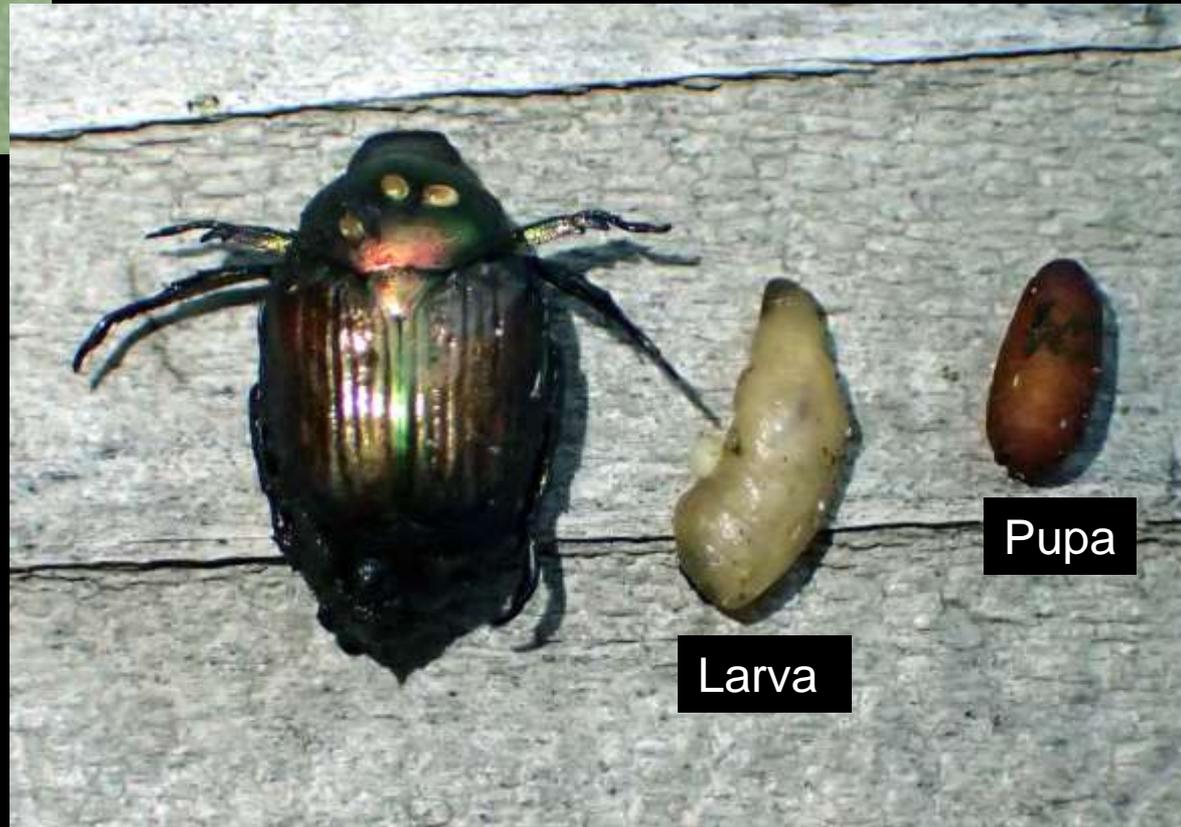


The egg(s) hatches and the larva of the fly enters the beetle.

Ultimately the beetle is killed.

The larva then migrates out of the beetle and moves into the soil where it pupates.

The adult emerges the following year.

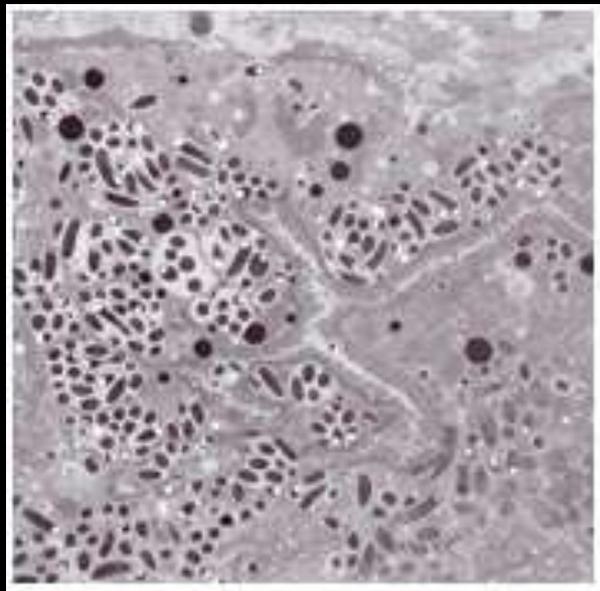


Status of *Istocheta aldrichii* Releases

- **Boulder**
 - 1 Release Site (2019)
- **Pueblo**
 - 1 Release Site (2018)
- **Denver/Littleton**
 - 2 Release Sites (2018)

Natural Enemies of Japanese Beetle for Potential Introduction into Colorado?

Ovavesicula popilliae – a microsporidian (fungal) disease of Japanese beetle larvae

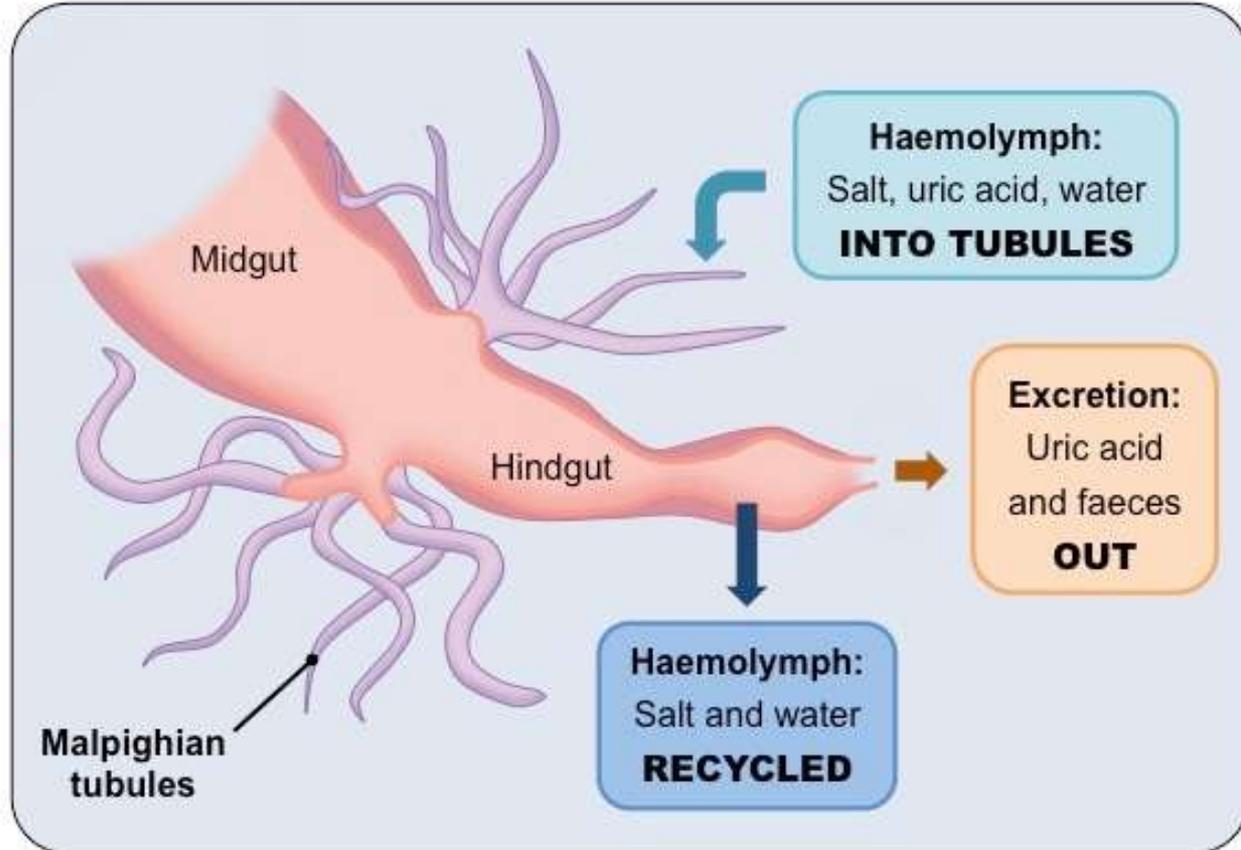
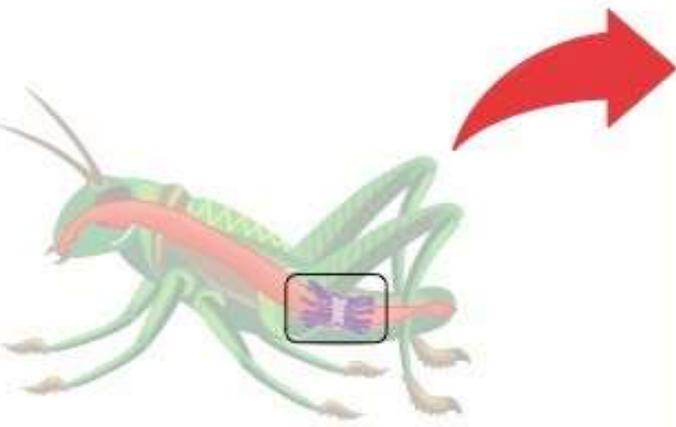
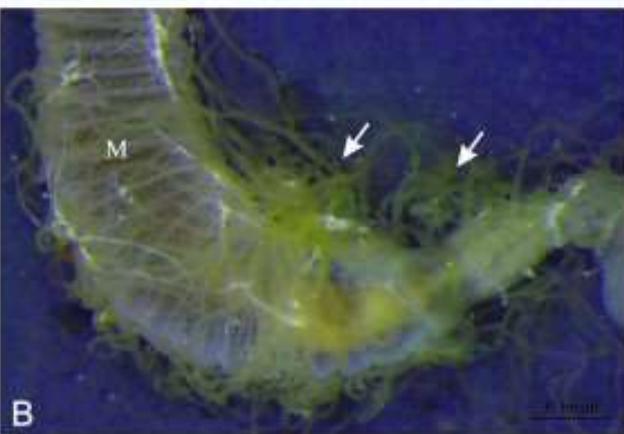
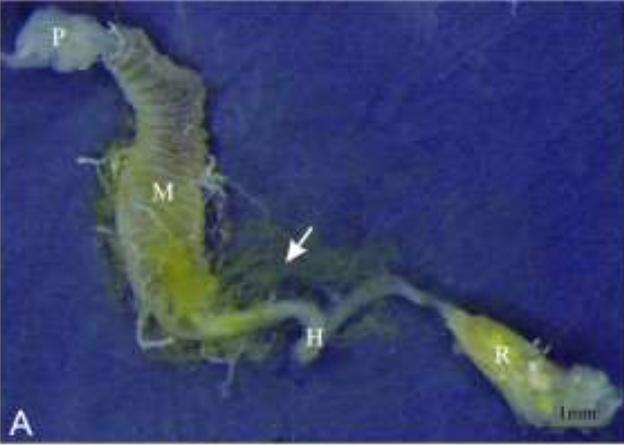


Ovavesicula infection of Malpighian tubules of Japanese beetle larva



Main observed effects from infection – reduced fecundity, reduced winter survival

The **Malpighian tubules** of insects filter wastes from the blood, functioning somewhat like what the kidney does in humans



Heavy *O. popilliae* infection of Malpighian tubules of Japanese beetle



Source: David Smitley, Michigan State University

Status of *Ovavesicula popillae* Releases

- **Boulder**
 - 1 Release Site, 2015)
 - **Confirmed established**
- **Pueblo**
 - 3 Release Sites (2015, 2018)
- **Denver/West Arapahoe Counties**
 - 6 Release Sites (2018)

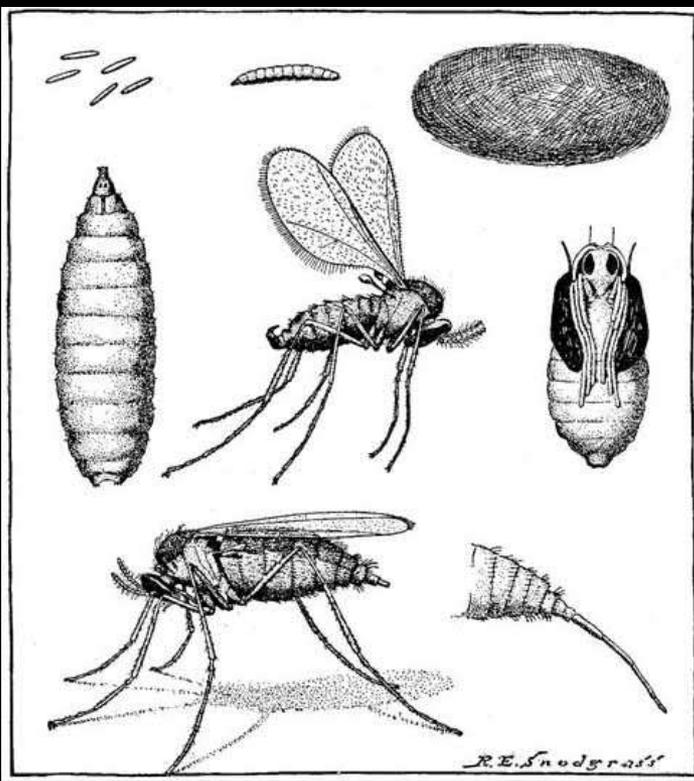
If the Japanese Beetle Biological Control Project works, what would be considered success?



In 10-15 years
there would only
be three
Japanese beetles
on your rose,
instead of ten

**A trial to find a
rose midge
control product**



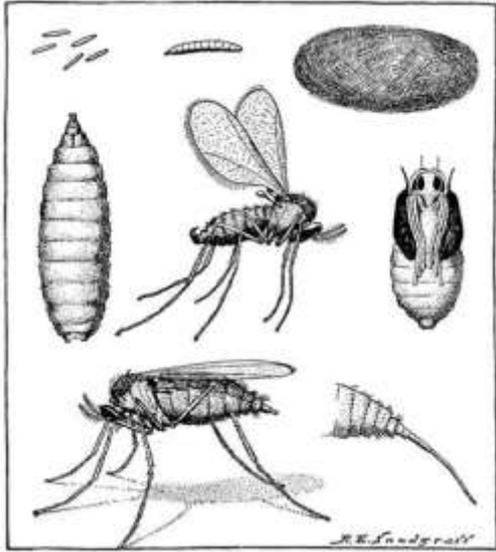


Rose Midge

Dasineura rhodophaga
Diptera: Cecidomyiidae

A tiny fly that
damages the
developing flower
buds of rose





Jim Baker, North Carolina State University

The adult midge lays eggs on developing shoots, flower buds



© Robin Rosetta, Oregon State University

Rose midge larvae are tiny cream colored maggots that slash the buds as they feed



David Shetlar photo



This results in a variety of symptoms that produce destruction or distortion of developing flower buds





A site was identified in 2019 for a trial to determine if any of the newer insecticides available to a rose grower might be effective for control of rose midge.

Dave Ingram of the Denver Rose Society was partnered on this project

Spinosad



Acetamiprid



The products chosen had to be available for retail sale, have high safety to bees, and were known to be effective against some kinds of other fly/midge pests.

Results

Treatment	No. Damaged Terminals/Plants
• Spinosad	• 0.85
• Acetamiprid	• 0.85
• Untreated Check	• 2.85

Bottom Line: Both treatments tested provided about 70 percent control

Description of a new virus disease of hemp



Newly identified insect- vectored pathogen of hemp – beet curly top virus



Photo by A.C. Magyarosy, Bugwood.org

Beet curly top virus is transmitted to plants
by the beetle leafhopper (*Neoaliturus tenellus*)



Beet curly top symptoms on
sugarbeet (above) and
tomato (below)





Beet Curly Top Virus produces a *wide variety of symptoms* on hemp





A slight chlorosis of the base of leaves, with some mosaic patterning was seen on all plants to some extent

“Classic” Symptoms





Twisting and curling of new growth
developed on many plants



A “Trifecta” of symptoms





Original main stem
shows strong
symptoms

Side shoots develop
that are generally
healthy looking

A very odd
symptom:
Bisymptomatic
Plants



Beet Curly Top outbreaks are common in western Colorado. The main crops affected are tomatoes, peppers, squash and beans.

The only way a plant gets infected with this disease is if a beet leafhopper, which has previously fed on a BCTV-infected plant, feeds on the plant.



Essentially all BCTV infections occur from beet leafhoppers, carrying the virus, which migrated into the area in late spring from New Mexico/Arizona

Beet leafhopper spends very little time in hemp and does not breed in the crop. It can transmit the virus after feeding for 10-15 minutes.

Colorado State University
Extension

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Western Colorado Insects

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TOMATO CURLY TOP VIRUS

Bob Hammon, CSU Extension, Tri River Area

Curly top is one of several insect-vectorated viral diseases that affect tomatoes. Seventy-five percent losses can occur in Western Colorado when conditions are favorable for the spread of the beet leafhopper (*Circulifer tenellus*), the vector of the virus.

Ideal conditions occur when fall and winter rains in the desert areas of New Mexico, Arizona, and Sonora and Chihuahua Mexico allow winter annual mustards to flourish during the winter months. Beet leafhoppers feed and multiply on these plants, then migrate north on storm fronts and with prevailing

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- Pesticide and Regulatory

Bob Hammon with the Tri-River Extension office spent many years researching all the available options to manage beet curly top on tomatoes

Results of this work can be found at the Western Colorado Insects website of the Tri-River Area Extension offices

Curly Top Research in Western Colorado

TRA Extension conducted research in tomatoes during 2006-2008 to evaluate methods of controlling curly top virus. In 2006, we conducted demonstration trials to evaluate tomato varieties for resistance to the virus. We also evaluated walls-of-water and floating row covers as control tactics. 2007 research looked at planting dates and row covers as management techniques in trials conducted at the Western Colorado Research Center at Orchard Mesa. Replicated trials were conducted in 2008 to look at the impact of plastic mulch color on curly top incidence. A planting time insecticide and SAR (Synthetic Acquired Resistance) trial was conducted to evaluate control options for commercial growers.

Click the following to view results of those trials.

[2006](#) [2007](#) [2008](#) [2009](#) [2012](#)

This page was updated on March 3, 2016

Mulch and Insects

- **Mulches can:**
 - alter light around plants
 - affect temperatures on plants
 - provide cover for insects around the base of the plants



Figure 1. Tomato planted on metalized vs. black plastic mulch (back - right).

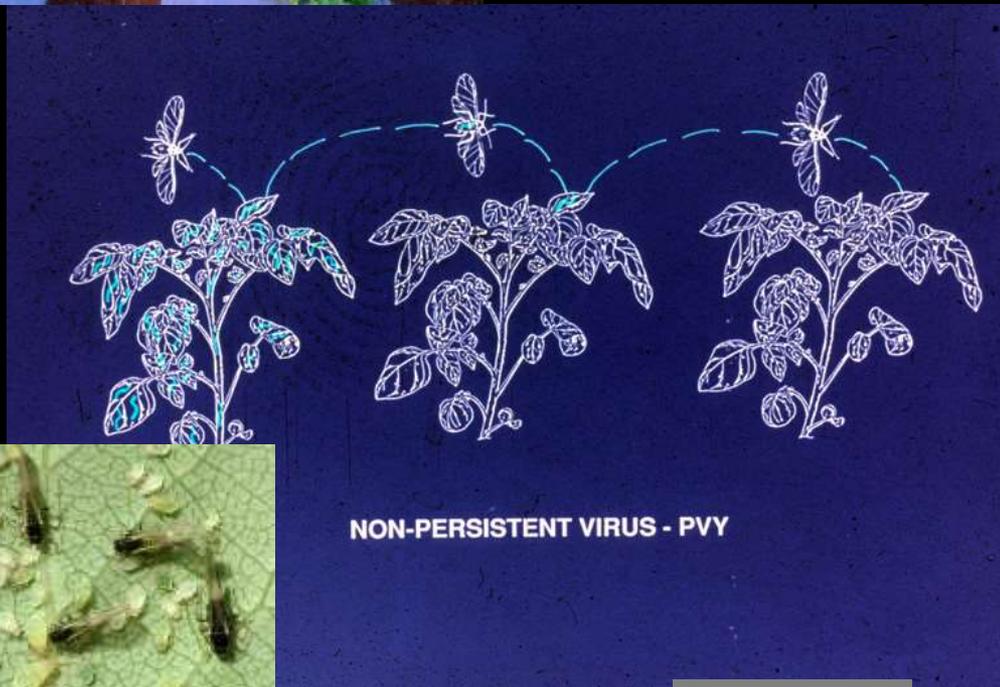
Reflective Mulches for Control of Insect Vektored Plant Diseases



Thrips



Leafhoppers



Aphids





Thank you!

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For more information on Colorado Insects check out the **CSU Insect Information Website**

For more information on Hemp Insects check out the **CSU Hemp Insect Website**